Part 781-03:
RECOMMENDATIONS AND IMPLEMENTATION STRATEGIES

This part will review the goals of Part 781-01, formulate objectives in support of those goals, and derive recommendations on how best to achieve them. Issues are explored and findings are presented as "Background" under each section.

03-01 ENERGY EFFICIENCY AND CONSERVATION

GOAL: Recognition that energy is a resource too valuable to waste and should be produced and used efficiently to extend the resource, protect public health, and sustain the environment.

03-01-01 Objectives

- To attain the goal of energy efficiency and conservation by pursuing it as a means to other ends desired in this *Energy Plan:* economic competitiveness, environmental quality, energy security, safe and environmentally friendly transportation, energy efficiency and accessibility for low-income households, and expanded use of renewable resources (described in Sections 03-02 through 03-06, and Section 03-08).

- To promote consumer awareness of the value of energy conservation and efficiency as part of a comprehensive energy education program (described in Section 03-07).

03-01-02 Background

There is one theme woven throughout the *Energy Plan,* and that is the pursuit of energy efficiency and conservation. Rhode Island is not blessed with an abundance of cheap and inexhaustible energy resources. It is in our best interest to conserve what we have by using it in the most efficient way possible.

Specific policies for accomplishing this are proposed in subsequent sections of this plan. In every sphere in which the state and energy consumers participate, from economic development to environmental protection to transportation to assistance for low-income families to education, energy efficiency and conservation are at the forefront of our recommendations. The state is making it its business to be aware of the latest technologies and methods — and to promote them wherever appropriate.

03-02 ECONOMIC COMPETITIVENESS

GOAL: A strengthened competitive posture for Rhode Island commerce and industry through access to adequate, affordable and reliable supplies of energy in all sectors of use, including transportation.

03-02-01 Objectives

- To promote fair and equitable energy pricing among all groups of consumers (end-use sectors).

- To mitigate high energy prices by making the best use possible of resources and technologies that use energy most efficiently, such as cogeneration, distributed and self-generation including microturbines and/or fuel cells, district heating, and conservation and load management.

- To promote regional approaches to energy issues and equitable solutions state by state, recognizing the common interest of the New England states, the multi-state nature of utility holding companies, and the regional impact of regulatory decisions affecting energy prices.

03-02-02 Background

A basic tenet of state policy is to enhance economic growth and development by assuring a competitive climate for Rhode Island's businesses. Together, commercial and industrial customers used over half of all energy consumed in Rhode Island in 1999. ((21))

In general, energy in New England tends to be more costly than in the rest of the country, but data suggest that electric and gas rates tend to be even higher in Rhode Island. ((19))

Our high energy costs are a result of many factors including, but not limited to, Rhode Island's distance from major sources of energy; our lack of, or lack of access to, federally subsidized power projects similar to the TVA and Bonneville Power; the strong influence that the Federal Energy Regulatory Commission (FERC) has on our wholesale electric rates; and the high fixed costs of constructing power plants in New England.

03-02-02-01 Natural Gas Pricing

The late 1970s and 1980s saw the deregulation of natural gas prices and significant changes in the market. Formerly, pipelines purchased gas supplies from producers and transported and resold the gas to local distribution companies (LDCs), which in turn resold the gas to their end-use customers. Under this system, with the pipelines serving both a transportation and a merchant function,

the cost of transporting the gas through the pipeline was combined ("bundled") with the sales price. ((6)), ((19))

With deregulation, gas producers and other brokers independent of the pipeline companies began selling directly to LDCs, in competition with the pipelines. Equal access to the pipelines was not assured, however, making it difficult to have competition on an equal footing with the pipelines and true market pricing. ((6)), ((13))

The Federal Energy Regulatory Commission (FERC) remedied that problem with "Order 636." Order 636 exacted further changes in the market, beginning with the requirement that interstate pipelines "unbundle" their sales and transportation services, and equalize the access to and cost of transportation of natural gas sold by themselves and their non-pipeline competitors. ((19)) This resulted in some pipelines opting to abandon their merchant functions completely, and others to offer limited supply services through unregulated marketing subsidiaries.

In sum, FERC Order 636 has meant that LDCs have added reassurance when shopping and contracting for their own supplies of natural gas. With that comes the opportunity for LDCs to customize their supply portfolios to match the requirements of the marketplace. Different packages of supplies can be contracted to meet year-round base loads, seasonal swing loads, and peaking requirements. The goal is to use supplies in the most efficient and cost-effective manner possible.

The deregulation of natural gas pricing at the supply source and the added reliability of supply resulting from Order 636 should afford LDCs the opportunity to negotiate the best possible price for a variety of sellers. One of the other benefits of Order 636 is a provision that allows holders of pipeline capacity to release (sell) portions of surplus capacity during periods of low demand to LDCs.

As a result of deregulation in the gas industry, Rhode Island has developed a vibrant market for large and medium sized commercial and industrial customers, those currently eligible for competition. As of now, some fifteen registered gas marketers serve 2,000 commercial and industrial customers. Marketers are strongly attracted to large gas customers with high load factors and tend to be less interested in smaller gas customers. Because of this, there is presently no plan to extend competition to these smaller customers.

Late in 2000, the price of natural gas on the New York Mercantile Exchange (NYMEX) tripled sending ripples through the economy. Because a considerable and growing segment of the region's electricity supply is produced by natural gas-fired generation this run-up in gas prices had the effect of raising the price of electricity as well. Natural gas is in demand as a fuel for the production of electricity because it is more environmentally benign than other fossil fuel choices and consequently such plants are easier to site. The increased demand caused by the many licensed, proposed and planned gas-fired power plants raise significant questions for future pricing and availability of natural gas.

The increased demand for natural gas may keep the price of this fuel high and will likely require increases in capacity of existing pipelines as well as the construction of new pipelines and other gas transmission or storage facilities. Further, as gas-fired generation becomes a larger part of the total generating capacity, the electric production becomes vulnerable to gas supply failure or interruption. ((5))

03-02-02-02 Electricity and Competition among Providers

The Utility Restructuring Act, which was signed into law on August 7, 1996, required retail competition to be phased in beginning on July 1, 1997. Competition has brought customers options: the Standard Offer Service, competitive market supply, and Last Resort Service. All utility customers as of January 1, 1998, and any new customers who entered the state after that date, could take Standard Offer Service. This provided an option for those customers who, for now, do not wish to enter the competitive market. Last Resort Service provided an option for those who did try competitive supply and then decided to leave the competitive market, or whose suppliers had left the market themselves. Standard Offer Service and Last Resort Service rates were fixed, while the market reflected fluctuations in costs and charges in the power generation industry, now independent of the utilities.

During 1998 almost all Rhode Island customers remained out of the competitive market. Beginning late in 1998 and continuing into 1999, usage supplied by the competitive market increased sharply, primarily in the industrial sector. The Energy Council - Rhode Island (TEC-RI), representing the larger industrial customers, formed an *aggregation* to purchase power at the best prices. ((18)), ((26)) Purchases from competitive suppliers peaked in September of 1999. By the second quarter of 2000, competitive supply had dropped to about one-tenth of the peak in 1999. As one would expect, reliance on Last Resort Service increased dramatically in 2000.

Most of the customers who chose to enter the competitive market returned to Last Resort Service. However, abandoning the competitive market did not turn out to be an effective shelter from rising prices. The price of Last Resort Service gradually was moved to the full market price. For the non-residential customers who went to the market in 1999 and then returned to Last Resort Service the following year, the cost of Last Resort Service likely offset any savings achieved in the market.

On May 1, 1999, the New England Independent System Operator (ISO-NE) commenced operation. Its progress to date can be judged based on market prices and development of new generating capacity.

In order to contend with the possibility of price manipulation within the regional electricity market, the Rhode Island Public Utilities Commission (PUC) has joined with the other New England states through the New England Conference of

Public Utilities Commissioners (NECPUC) to intervene in numerous dockets before the Federal Energy Regulatory Commission (FERC). The PUC has been very actively involved in regional issues participating in weekly NECPUC conference calls and attending dozens of NEPOOL meetings as well as crafting interventions before the FERC.

The NECPUC filing in the FERC's Regional Transmission Organization Docket, to cite one example, calls for a strong and independent market monitoring and mitigation unit to be established in our region. Currently ISO-NE is responsible for market monitoring and mitigation. While the ISO is presumed to operate with the utmost diligence and integrity, regional regulators question whether it is sufficiently independent of market participants or vested with enough resources to ensure that efficient wholesale markets have been developed and that these markets operate free of market distortions.

Further, the time is ripe for a thorough reconsideration of ISO-NE's market structures, prices and charges. NECPUC and other organizations should address a full range of options. One idea is to change the way wholesale energy prices are settled in New England. ISO-NE operates its energy market as a *POOLCO*. This means that, while generators are expected to bid based on their costs, they are paid based on the most expensive bid accepted in each hour (the market-clearing price). There should be a careful investigation into the concept of paying each bidder that is selected to run the amount they bid rather than the price at which the market clears. Another idea worth exploring further is to require bidders to supply ISO-NE, or a successor organization, with cost information along with their bids. Such information is required now in the PJM-ISO, which operates the regional grid in Pennsylvania, New Jersey and Maryland.

New England is experiencing a surge in the construction of new generating capacity. ISO-NE expects generation additions from late 2000 through 2005 to total at least 7500MW. This constitutes a large addition to existing generating capacity that amounts to just over 26,000MW. Additional units, currently permitted, could bring total additions well in excess of 11,000MW. This means that winter capacity is expected to grow significantly, in the range of 28-45 percent by 2005.

Most of these permitted units are gas-fired. Thus, their addition will raise New England's dependence on gas for electric generation, significantly adding to the gas price and supply issues discussed above and raising issues of over-dependence on one fuel for electricity production.

03-02-02-03 Conservation and Load Management

Conservation and load management (C&LM) programs are in effect for all Rhode Island utilities. They have, on the whole, met with success. The few that have not met the strict cost effectiveness tests applied to all have been dropped. Savings have been very carefully evaluated both by the utilities and by outside consultants through a variety of methods, including billing analysis and

submetering. ((27)) It is therefore useful to encourage C&LM programs — sometimes referred to as demand side management — when it can be shown conclusively that such programs are cost-effective and available to all customers.

As retail competition evolves nationwide in the electric industry, cross-subsidies for funding conservation measures between or among sectors (industrial and residential, for example) will probably be discouraged to avoid market distortions. It will become inappropriate to subsidize. Conservation will have to stand on its own as a resource, just like electricity itself. It will be interesting to see if the long-term value of conservation is recognized by the power market.

03-02-02-04 Energy Efficiency and New Technology

Finally, it is important to recognize the increasing role that energy efficiency will play in our ability to compete on an economic basis with other regions of the country. The energy cost associated with manufacturing may well determine whether our goods can be priced competitively with those manufactured elsewhere. We need to make every effort, therefore, to move toward greater efficiency. One means could be to encourage distributed generation (disgen) whenever economically and environmentally practical to enhance the performance of the distribution network and to help meet peak loads on the system, as well as using renewable energy sources or very efficient technologies for specific, on-site applications (i.e., self-generation).

One technology with considerable promise is the fuel cell. Although the first fuel cell was built in 1839, practical applications were not developed until the 1960's when fuel cells were selected to provide electricity and water for spacecraft. In principle a fuel cell operates like a battery but does not require re-charging. A fuel cell consists of two electrodes with an electrolyte in between. Hydrogen is fed to the fuel cell anode and oxygen to the cathode to produce electricity, heat and water. A catalyst is required to split the hydrogen atom into a proton and an electron at the anode. Different electrolytes are used in the different types of fuel cells. Since hydrogen is difficult to store, most fuel cell systems include a re-former that can extract hydrogen from hydrocarbon fuels such as natural gas, methanol, or gasoline.

Since fuel cells have no rotating parts, they have the potential to be more efficient than combustion systems. The first generation phosphoric acid fuel cells operate at a 40 to 45 percent fuel to electricity efficiency, which is in the same range as the most efficient topping cycle power plants and above the 35 percent efficiency average for the U.S. power grid. Second generation phosphoric acid fuel cells are expected to be 50 to 60 percent efficient while current molten carbonate and solid oxide fuel cells, which operate at much higher temperatures, have the potential to reach fuel to electricity efficiencies of 50 to 60 percent. At these higher temperatures, these systems could achieve up to 85 percent efficiency when operated in combined cycle applications. The more expensive alkaline fuel cells used by NASA on space missions can achieve power-generating efficiencies of up to 70 percent.

More than two hundred, 200kW phosphoric acid fuel cells systems have been installed around the world. They are used in hospitals, nursing homes, hotels, office buildings, schools, power plants, airport terminals and municipal landfills. Proton exchange membrane fuel cells are being developed for transportation applications. Many automobile companies have prototype models being tested. Molten carbonate fuel cells, ranging from ten kW to two MW, have been tested with a variety of fuels. Stationary applications of these units have been demonstrated in Japan, Italy and the United States. Solid oxides fuel cells show promise for large high power applications.

Fuel cells are available commercially for about $3,000 per kW. As a result, fuel cells are competitive only in high value markets and in areas where electricity is not available or the price is high compared to natural gas. The goals are to increase the efficiency and reduce the cost to $400 per kW by the year 2015. ((16)), ((28))

03-02-03 Policy Recommendations

- State policy should encourage cogeneration, disgen including self-generation, and renewable projects that provide significant amounts of thermal energy while producing electricity for commercial, industrial and institutional facilities.

- State policy should encourage incentives to preserve dams providing or with high potential to provide hydroelectricity with minimal environmental conflict.

- State policy should continue to support small and medium sized cogeneration facilities. The following recommendations should be continued and periodically reviewed and improved upon, as energy efficient and environmentally sound:

    a. The generation facility should be located in close proximity to the customers' (or customer's) facility;

    b. At least 25 percent of the total annual energy output of a cogeneration facility should be in the form of thermal (heating or cooling) or other useful energy, including mechanical;

    c. A process should be established to reimburse the state sales tax on cogeneration equipment that meets the aforementioned criteria.

- State policy should encourage the use of more efficient heating, ventilation, air conditioning and lighting technologies to reduce electric consumption.

- State policy should promote the use of more efficient motor drive and fuel cell technologies to reduce electric consumption in the commercial and industrial sector.

- State policy should encourage the formation of partnerships with universities, state agencies and utilities to provide engineering analyses for commercial and industrial establishments to improve energy efficiency.

- The state should examine and, if possible, encourage policies in which utilities become direct partners in community economic development efforts, promoting compact development wherever practical to support cogeneration, self-generation, renewable, and other efficient technologies. The rate that the utilities charge to provide back-up service when on-site generators are "down" should fairly compensate the utilities for this service, but should not be a financial disincentive to developing distributed generation.

03-02-04 Other Recommendations

- The R.I. Public Utilities Commission (PUC) and other interested parties should determine and mitigate potential adverse effects and/or maximize potential benefits of FERC regulatory and deregulatory actions.

- The New England Governors and their Congressional delegations should join in an effort to promote regional hearings on FERC rate cases. Every effort should be made for regional recommendations to FERC for cases that involve more than one state (those who have multi-state holding companies in common).

- New England states should coordinate FERC intervention through their respective Attorney Generals' offices, Public Utilities Commissions and energy offices. This is an ideal opportunity for regional cooperation to obtain lower cost and environmentally sound energy.

- The utilities should continue to explore methods of assisting their customers in conservation and load management.

- The State Energy Office should continue to identify and pursue energy savings opportunities in state buildings and place strong emphasis on adhering to operating and maintenance procedures that ensure peak energy system performance. Directives to conserve energy should be fully implemented by tracking and reducing energy use at state facilities.

- The State Energy Office should provide education and technical assistance to municipalities to conduct energy audits and to improve energy efficiency for municipal buildings, including schools.

- The PUC should continually evaluate utility rebate programs to stimulate replacement of old, inefficient lighting and cooling appliances with the most efficient and cost effective commercially available technology.

- The New England Conference of Public Utilities Commissioners (NECPUC) should continue to support the establishment of an independent market

monitoring and mitigation unit, fully staffed, and capable of meeting the FERC's standards for a smoothly functioning wholesale electricity market, free from market power abuses.

03-03 ENVIRONMENTAL QUALITY

GOAL: Setting and achieving objectives that preserve or enhance environmental quality while ensuring adequate energy supplies.

03-03-01 Objectives

- To promote energy conservation and efficiency in all end-use sectors to reduce air and water pollution resulting from electric power generation and the extraction, processing and burning of fossil fuels.

- To maintain and where possible improve air and water quality and conservation when new energy development becomes necessary.

- To promote less polluting alternative fuels wherever practical to reduce contributions to greenhouse gas emissions and global climate change.

- To promote worker and consumer safety in all aspects of infrastructure improvement, particularly gas and petroleum pipelines, as the most fundamental environmental quality issue.

03-03-02 Background

All energy use has environmental impacts. Fossil fuels (oil, gas and coal) account for 95 percent of the state's energy demand. ((21)) Their impacts occur at several stages — drilling, mining or extraction, transport, processing and combustion.

In Rhode Island — which lacks oil or gas fields, refineries or producing coal mines — the major negative impacts of fossil fuels arise from their combustion. By-products of combustion include the *greenhouse gases* carbon dioxide, methane, and nitrous oxides. Many scientists believe that as greenhouse gases accumulate, they reach a level where they modify the heat gain/loss balance from solar radiation and contribute to global warming. It is estimated that 98 percent of the greenhouse gas emissions in Rhode Island is attributable to the burning of fossil fuels. ((32))

The federal Clean Air Act and state regulations set limits for the release of certain combustion gases, such as carbon monoxide, sulfur dioxide and nitrogen oxides. Carbon monoxide is toxic. Sulfur dioxide contributes to acid rain, where it has been converted chemically into droplets of sulfuric acid. Oxides of nitrogen contribute to ground-level ozone. As in many areas in the Northeast, the current

health-based ambient air quality standard for ozone is not attained in Rhode Island; in fact, the state is considered a *serious nonattainment area* for that pollutant. ((30))

Another potentially problematic by-product is particulate matter, which can irritate and damage the lungs, causing breathing and other health problems.

A sound energy policy that promotes conservation and substitutes other fuels will reduce the need for the combustion of fossil fuels, and therefore the generation of harmful by-products. However, there will be many instances where fossil fuels are the only feasible option, and our environmental policy will have to address the concern at the smokestack or tailpipe.

Safety is another issue, particularly in the transport of energy. Forecasts conclude that natural gas demand will rise over the next several years to accommodate new electricity generation. This means building new pipelines to deliver the gas or expanding capacity on existing lines by increasing compression. ((29)) It is incumbent upon permitting and licensing authorities to ensure that the construction and operation of new or expanded pipelines occur in the safest possible manner. For the pipelines' neighbors and customers, safety will be the paramount environmental quality issue.

03-03-03 Key Legislation

Legislative and regulatory developments in the 1990s reflected an increased awareness of the links between energy and the environment. They will have long-term effects on our energy choices. Of particular note are the Clean Air Act Amendments of 1990 (CAAA), the Energy Policy Act of 1992 (EPACT), and the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and its successor, the Transportation Equity Act for the 21st Century (TEA21), which dramatically intertwine energy, environmental, and transportation issues.

The ISTEA authorized federal spending for transportation projects through 1997, including highways, mass transit, bikeways and trails, and protection of scenic resources. The Transportation Equity Act, continues the major policies of the ISTEA, allowing for flexibility to respond to complex transportation needs.

The CAAA regulates the emission of air pollutants that are toxic or that cause elevated levels of ground-level ozone, acid rain or stratospheric ozone destruction. Dramatic reductions in the emissions of nitrogen oxides, volatile organic compounds, and other pollutants from power plants, factories, motor vehicles, and other sources are being planned accordingly.

The regulatory philosophy behind the CAAA is that all sectors that contribute to poor air quality must be considered. Where industrial activity is high, for example, mitigation of air pollution may be achieved by the installation of air pollution control equipment, changing fuel, and modifying processes — and by

requiring automobiles and trucks to use reformulated gasoline to reduce exhaust emissions. ((30))

In a similar vein, states have implemented enhanced "inspection and maintenance" (I&M) programs for motor vehicles to ensure that they do not emit pollutants above the levels intended for those vehicles. Rhode Island is among them, with a program in which automobiles and light trucks up to 25 years from the model year are tested biennially for carbon monoxide and hydrocarbon emissions.

States such as Massachusetts, Connecticut and New Jersey have established a system of pollution "credits" that could be legitimately traded, bought or sold between factories. Under such a system, the industrial sector would be subject to certain standards for meeting air quality goals. "Cleaner" factories (those that surpassed those standards) would amass pollution "credits" that could be sold to "dirtier" factories (those unable to meet the standards). The pollution credit market would have to be closely monitored, of course, to make sure that air quality standards were still being met by the industrial sector overall. Local air pollution attributable to sources unable to meet the standards but able to purchase credits could raise questions about "environmental justice" as well.

The CAAA also recognizes that Rhode Island and other states, while creating some of their own air pollution, are adversely affected by pollution drifting in from areas upwind. The CAAA has set up the Ozone Transport Commission to allow states in the Northeast to work together as a region to address the transport of air pollutants. ((30))

Achieving the CAAA's requirements will be costly. On the other hand, not meeting the requirements by the mandated deadlines will subject so-called "nonattainment areas" to federal penalties.

Moving toward attainment will avoid other penalties as well. A cleaner environment will reduce the future costs of dealing with the public health consequences of polluted air.

On the same track, the EPACT of 1992 requires federal, state, and local governments, alternative fuel providers, and private fleets buy alternative fuel vehicles (AFVs) in increasing percentages when replacement vehicles are needed. The EPACT is enforced through the Alternative Fuel and Clean Cities Programs. In Rhode Island, the Alternative Fueled Vehicles Incentive Act of 1997 provides tax credits to those using domestically produced alternative fuels as described in the EPACT. These have been outlined in Section 02-05-03. ((3))

Rhode Island is concerned about the generation of greenhouse gases and their effects on the environment. The R.I. Department of Environmental Management recently contracted with Brown University's Center for Environmental Studies to conduct a *Rhode Island Greenhouse Gas Inventory.* The report provided a comparison of greenhouse gas emissions for Rhode Island for 1990 and 1996. It found that total carbon emissions ("carbon dioxide equivalence,"

expressed as metric tons of carbon equivalent, or MTCE) from fossil fuel combustion in the residential, commercial, industrial, and transportation sectors – excluding electric power generation – increased 13 percent in that six-year period. ((32))

Rhode Island has signed on to the Regional Climate Change Action Plan produced with the New England Governors Association and Eastern Canadian Premiers that sets regional targets for greenhouse gas emissions reduction to 1990 levels by 2010, and to 10 percent below 1990 levels by 2020.

The Governor's Office, R.I. Department of Environmental Management and State Energy Office are collaborating with four working groups on the *Rhode Island Greenhouse Gas Action Plan* Project, the intent of which is to develop a portfolio of prioritized programs across all sectors. One of the working groups is focusing on energy supply, renewables, and solid waste. Stakeholders will seek consensus on the best greenhouse gas reduction strategies wherever possible. There is representation from the private industrial and commercial sectors, non-profits, environmental organizations, academic and government institutions, and the general public, along with other groups including the American Automobile Association (AAA) and RIPTA. In all, more than 80 individuals are involved.

Project leaders expect the *Greenhouse Gas Action Plan* to be completed in early 2003. Preliminary options can be seen on the web site **http://righg.raabassociates.org**. ((33)), ((35))

As we attempt to develop state energy policy, it is imperative that the interactions between energy and the environment be kept in mind. This plan sets forth recommendations that will help incorporate environmental consequences into energy choices.

03-03-04 Policy Recommendations

- The state should support energy conservation and efficiency as a means of helping achieve air and water quality goals.

- The Rhode Island Department of Environmental Management (RIDEM) and other state and quasi-public agencies should adopt policies to ensure that, as industrial capacity expands, overall air and water quality do not deteriorate. One opportunity is the *Rhode Island Greenhouse Gas Action Plan* now under development. The recommendations of the stakeholders involved in the *Action Plan* process should be reviewed for the amount of greenhouse gas reduction anticipated and the costs and benefits associated with each strategy.

- Similarly, the RIDEM should adopt policies in keeping with the regulatory philosophy of the federal CAAA to ensure that changes in one end-user sector (transportation) will not impede development in another (industry) due to requirements to maintain or improve overall air and water quality.

- The state should work with other states in the region to assure that all areas that emit pollutants affecting the air quality in Rhode Island will implement similar controls on pollution sources.

- The state should encourage national energy policies (e.g., the National Energy Policy Act, CAAA) that reduce air pollution through strict standards and/or tax relief on less polluting fuels, and support the development, demonstration, and promotion of photovoltaics, alternative-fueled vehicles, advanced generating technologies, wind generation, and other long-range alternatives.

- State policy should encourage the federal government to support research on energy storage, photovoltaics, and other promising technologies that might reduce dependence on fossil fuels.

- State policy should encourage use of renewable energy (particularly wind, landfill gas, and photovoltaics) to the maximum extent technically feasible by assessing their potential in all decisions that affect energy supply price or use.

03-03-05 Other Recommendations

- Through an Executive Order, the Governor should direct all state agencies to adopt, wherever feasible, energy saving systems such as cogeneration, fuel cells, renewables, microturbines cooling, water conservation, energy conservation, and fuel optimization.

- The RIDEM should require all new power plant owners to absorb the costs of post-license monitoring of all environmental impacts to ensure compliance with permitted levels.

- The State Energy Office and the State Building Code Commission should continue to implement, through the building code, cost-effective solutions for energy conservation and efficiency in residential and commercial buildings in order to reduce the air and water pollution associated with new electric generation or the extraction and processing of fossil fuels.

- The Energy Facility Siting Board and other review agencies should consider local quality of life issues when reviewing proposals for new power plants or other facilities with environmental impacts during construction and operation, including visual impact and noise.

- The RIDEM should investigate the feasibility of creating an air pollution credit “bank” to permit the sale or purchase of credits by smokestack industries when an economic benefit can be demonstrated (e.g., keeping a plant open that would otherwise be forced to close), and the air quality overall is not degraded.

- The Air Quality Transportation Subcommittee of the Technical Committee of the State Planning Council should continue to investigate and support various

options for mass transit initiatives and bulk freight handling systems (barge and rail, as an alternative to trucking along highways and secondary roads).

- As infrastructure expands to meet future needs, in particular power transmission lines and gas or petroleum pipelines, safety must be the paramount concern from siting to construction to operation. Breaches or ruptures, whether by natural events such as floods from severe storms or by human error and carelessness, must be avoided by design and practice.

03-04 ENERGY SECURITY

GOAL: The attainment of a fuel mix that is reasonably reliable and that satisfies economic need.

03-04-01 Objectives

- To reflect — in state policies calling for the appropriate fuel mix — the supply, deliverability and price risks of various forms of energy.

- To enhance energy supply through conservation programs and appropriate technology that leads to more efficient energy use.

03-04-02 Background

Rhode Island's energy markets are integrated with those in New England and beyond, as explained in Part Two. Electricity comes from a regional grid; natural gas, from Texas, Louisiana and western Canada, via interstate pipelines; and petroleum products, from producing states in the south and west and from overseas. Even power plants within the state are dependent on fuels coming from outside the state, as we have no indigenous supply of hydrocarbons to power them.

Events occurring far beyond our borders could have a devastating impact if they resulted in supply disruptions, given our dependence on energy sources outside our state and region. Moves toward energy security therefore should take at least three basic courses: develop the resources we have in-state, such as low-head (under 100kW) hydropower, to the greatest extent possible; stretch the supplies we have through conservation and load management strategies covering not only electricity, but fossil fuels in all applications and renewable energy as well; and diversify our sources of energy wherever practical to avoid overreliance on any one type. Solar power, both passive and active, and wind energy can also contribute to our long-term energy security.

03-04-02-01 Electricity

Major electric utilities like Narragansett Electric have C&LM programs that conserve electric energy by shifting power consumption to off-peak hours. Power plants have to be maintained in top form (and retired and replaced if necessary) for such shifts in consumption to be successful.

An increased reliance on "market plants" in the regional mix and an easing of peak demand suggests less of a need for so-called *peaking plants.* These are designed not for continuous operation but to augment existing capacity during times of high energy use, to prevent brownouts. Regardless of the success of the utilities' C&LM programs, most experts believe peaking plants will continue to be important, especially when planning future capacity.

Competition and open access in the retail power market carries with it the possibility that market forces will lead to lower consumer prices. However, the reliability of supply may be affected as well. Regulated monopolies (the traditional utilities) had the obligation to provide power to their service areas; on the other hand, the independent suppliers emerging as a result of market restructuring may set more flexible terms in return for lower retail prices, including "potentally interruptible" supply. We have seen suppliers move into and out of the local market adding elements of risk to the reliability of their customers' supply that simply did not exist under the former vertically integrated system.

As market restructuring continues state by state in New England, the supply end of the electric industry, consumers in all use sectors must be sensitive to the trade-off between true competitive pricing and the old method of setting rates to guarantee supply. Consumers need to pursue energy conservation *particularly* in a free market to avoid spikes in demand that will drive up cost and may even interrupt supply.

03-04-02-02 Natural Gas

With its relatively clean-burning characteristics, natural gas has seen substantially increased use in Rhode Island. Natural gas is being used to fire Manchester Street Station, for example, as well as Ocean State Power. Growing use in the industrial sector has already been noted in Part Two.

Because we do not have any native gas to exploit, we cannot afford to squander our supplies. We must be sensitive to distribution methods and pricing policies to ensure a secure supply. Once again, conservation is essential to contain costs.

Promoting natural gas in end-uses for which it is appropriately suited makes sense economically, particularly if the alternative is to use electricity for the same purpose. It is more efficient to use gas *directly* for space heating or cooling, for example, than to use that gas to generate electricity to power an electric heater or air conditioner. The effect is analogous to eliminating a middleman who is brokering the delivery of a good or service: it is cheaper and more efficient to go to the source. Electricity, in this case, would be the middleman. That electricity could

be put to work more sensibly to provide lighting, its own direct end-use. Regionwide seasonal demand peaks — driven by direct and indirect end-uses — could be proportionately reduced.

The use of small-scale, on-site gas-fired cogeneration can also enhance energy reliability and bring energy costs under control for industry.

03-04-02-03 Petroleum

Disruptions of oil supplies due to world politics shook the western world in the 1970s, and the tremors are still being felt today. As the level of petroleum imports rises, fear grows that we are once again becoming too dependent on "foreign oil" and therefore liable to the same consequences.

Whether that fear is well-founded is a matter of debate, but Rhode Islanders nevertheless have a strong interest in seeing that our petroleum is used wisely. The statistics in Part Two indicate that two-thirds of our homes are heated with oil. The transportation sector is virtually the exclusive domain of oil, and it remains strong in industry, despite inroads made by natural gas. Supply disruptions should be a very serious concern.

As with natural gas and coal, Rhode Island lacks the producing fields and refinery capacity needed to replace imported oil. For our state, *all* oil — whether from the Middle East, Indonesia, Alaska or the Gulf of Mexico — is imported, in the sense that it is brought in from outside.

Shortages of petroleum products may occur at several points in its complicated distribution process. Oil companies sometimes place limits on retailers because of production problems or for business reasons (the shortage of a particular grade of fuel, for instance, or the temporary closing of a station). Disruption of crude oil supply, refinery operation difficulties, or surges in demand can affect an entire region, leading to price increases and long lines at service stations.

Adequate storage of petroleum products in a region would seem essential to guard against disruptions of supply. The federal government has maintained a "Strategic Petroleum Reserve" since the 1970s. In the winter of 2000, the federal government, as an amendment to the continuing resolution for the Strategic Petroleum Reserve, established the Northeast States' Regional Petroleum Reserve with a capacity of 2,000,000 bbl. Rhode Island is now part of that regional reserve, accounting for 150,000 bbl. of reserve supply in-state.

As for the private sector maintaining a significant petroleum reserve, inventory taxes and the insurance liability militate against storing vast quantities of product in excess of customer demand. ((20))

03-04-03 Energy Security in the Future

Rhode Island may never be self-sufficient in energy, and therefore never totally "secure." Energy planners in industry and government must evaluate the overall supply, pricing risks and environmental impacts of all energy sources in deciding the appropriate mix of fuels for the future. Fuel diversity and intelligent end-use choices will reduce the insecurity that comes from our lack of indigenous resources.

Rhode Islanders have proven themselves worthy of the challenge and have been recognized nationally as leaders in energy conservation. Conservation and load management needs to be coupled with more efficient, and where applicable more appropriate energy use. Passive and active solar systems have been seen in our residences, office buildings, factories and even our sailboats. Wind machines of various designs have been tested and used along our coastline. Small hydro facilities generate modest amounts of electricity for a handful of industrial users. Another option, fuel cells, continues to hold great potential for use in New England.

Real energy security is thus likely to derive from diversity in the energy mix, the wise use of resources, and the ingenuity of both producers and consumers to deal with the problem constructively.

03-04-04 Policy Recommendations

- State policy should encourage direct use of gas in end-uses determined to be economically and environmentally appropriate, especially those which help reduce electric demand during summer and winter peak demand periods.

- State policy should support expansion of natural gas pipeline capacity into the region and state for direct end-use applications and electric generation.

- State policy should continue to reduce dependence on oil through conservation and the enhancement of fuel diversity.

- State policy should encourage conversion of gas-fired electric generating units to dual fuel capability (with oil) to enhance system reliability.

- State policy should encourage the development of an electric distribution system including independent cogeneration to provide increased reliability as new capacity is needed.

- State policy should stimulate the introduction of new technologies that include wind, solar and fuel cells to provide new capacity as needed, and methods to decrease resistance in both electrical motors and transmission lines to increase the efficient use of power.

03-04-05 Other Recommendations

- Fuel use should be supplemented wherever practical with on-site conservation measures and applications of wind or solar energy.

03-05: TRANSPORTATION

GOAL: Energy-efficient and environmentally-friendly options for the movement of people and goods.

03-05-01 Objectives

- To promote transportation alternatives to the automobile to reduce traffic congestion (such as bus, bicycle, commuter rail and walking, where appropriate).

- To increase the use of alternative fuels that reduce air and water pollution.

03-05-02 Background

An energy plan for the transportation sector needs to pursue a five-fold strategy — increasing system efficiency through improved transportation system management; reducing the amount of vehicle miles of travel (VMT) by single occupancy vehicles through transportation demand management measures; increasing fuel efficiency of both automobile and light duty trucks; reducing emissions from motor vehicles and their fuels; and demonstrating and evaluating improved and alternative fuels.

Energy consumption in the transportation sector amounts to 31 percent of the total energy (in Btu) consumed in Rhode Island. ((21)) This sector's almost total dependence on petroleum products makes it a significant and attractive target for reducing energy consumption in the state, and for broadening the use of alternative fuels.

03-05-02-01 Impacts of Automobile Use

A number of factors have contributed to a significant increase in the demand for petroleum in the state's transportation sector. These factors include a dispersion of population and jobs known as "urban sprawl," as witnessed by the growth of residential development and population growth in Kent and Washington Counties and the growth of the suburbs as major employment centers. Inexpensive gasoline and an over-five-percent increase in registered motor vehicles in the state between 1990 and 2000 have led to increases in travel by motor vehicles, in spite of state policy support and investments for bike paths, public transit, and other travel alternatives.

Total annual vehicle miles traveled in the state increased from just over 7.0 billion miles in 1990 to just under 7.9 billion miles in 2000. Trends throughout the

1990s toward larger, less fuel-efficient vehicles have also eroded progress made in past decades on energy conservation in the transportation sector.

Increased numbers of personal vehicles also have environmental impact. In 1997 in Rhode Island, automobile, bus and truck exhaust ("mobile sources") comprised approximately 42 percent of all volatile organic compounds (VOC) and 60 percent of all nitrogen oxides (NOx) human activities put into the atmosphere. These compounds are the major ingredients in ozone smog. Among mobile sources, automobiles (including passenger cars and light duty trucks) emitted about 69 percent of the NOx and 89 percent of the VOCs. Much of the remainder came from various types of off-road vehicles and gasoline-powered yard equipment. ((15)), ((30))

Older vehicles typically emit higher levels of VOCs and NOx. This is the result of less stringent emissions standards in vehicle design at the time of manufacture, or the malfunctioning of emission control equipment due to age or poor maintenance. Enhanced inspection and maintenance (I&M) programs are in place to compel the repair of damaged or nonfunctional emission controls and are being expanded to inspect and maintain diesel engines and off-road vehicles. ((31))

03-05-02-02 Some Alternatives

In the short-term, the most effective measures to improve mobility and reduce fuel use and air pollution for transportation will be carpooling, vanpooling and improved mass transit options. Also effective will be measures that ease congestion through adjustable work hours, traffic signal management, express buses, and Intelligent Transportation Systems (ITS), which include highway advisory radios, computerized traffic signalization systems, and other devices that are used to manage traffic at a Transportation Management Center. The state can reduce its fuel use and air pollution by encouraging the purchase of modern vehicles that incorporate the best available technological advances in fuel efficiency or alternatively fueled vehicles.

Over the long-term, coordinated land use can reduce dependence on single occupancy vehicles by enabling more people to work, shop, and fulfill daily needs near their homes or within reach of mass transit. Also, working from a home base with the aid of a computer (telecommuting) will reduce the necessity for traditional modes of transit, thereby cutting vehicle miles, energy expenditure and mobile source emissions.

Rhode Island's policy is "fuel neutral" in its consideration of various alternative transportation fuels. One hundred fifty vehicles in the state fleet currently run on alternative fuels. Rhode Island seeks to meet the standards set forth in the National Energy Policy Act of 1992 (EPACT) regarding alternative fueled vehicles in state fleets, thereby setting the example for municipalities who may be contemplating converting to alternative fuels.

Ironically, the state's transportation budget is *dependent* on gasoline consumption. Budgets for the R.I. Department of Transportation (RIDOT) and Rhode Island Transit Authority (RIPTA) are predicated on earnings from the fuel tax – the more consumed, the higher the budget. ((36)) This works counter to incentives, policy recommendations and federal mandates to reduce consumption and promote alternative fuels. Clearly, as the ground transportation element of the State Guide Plan notes, other methods need to be proposed and investigated for funding RIDOT and RIPTA.

03-05-03 Policy Recommendations

- State policy should encourage maximum use of mass transit and HOVs, such as car and van pools, through pick-up delivery shuttles, off-peak bus service, fees for private parking, and support of RIPTA.

- State policy should support other means of reducing VMT and gridlock wherever they are cost-effective, including rail, bikeways, congestion management, telecommuting, and land use that discourages "sprawl" (so that people can walk, bike or ride public transit to the places they need to go).

- State policy should encourage optimum maintenance of all vehicles, with the state's program for its own fleet setting the example.

03-05-04 Other Recommendations

- The state should support and implement alternative long-term transportation strategies for people and goods that save energy, reduce traffic on highways and improve air quality, such as mass transit and bulk freight handling systems (barge and rail).

- The Statewide Planning Program should continue to promote local land use planning that minimizes energy needs.

- The state should continue to expand or adopt programs to save energy and reduce air pollution in the operation of its own fleet, and other public and privately owned fleets.

- The state and the Rhode Island Congressional delegation should support increased Corporate Average Fuel Economy (CAFE) standards and strategies to reward fuel efficient cars and discourage inefficient ones.

- The state should continue to encourage the siting of additional alternative fuel filling stations for the convenience of AFV fleets and to convince others to make the switch to alternative fuels as fleet vehicles are replaced.

- The state should support the use of hybrid vehicles as a means of increasing overall fuel efficiency in its fleet and within the mandates of EPACT, and

resolve the contradiction in policy presented by the dependence of the state's transportation budget on the gasoline tax.

- The Rhode Island Congressional delegation should urge increased research and development funding for renewable/sustainable transportation fuels at the federal level.

- The RIDEM should develop innovative ways to make fleets eligible to trade "clean air credits."

03-06: ENERGY EFFICIENCY AND AFFORDABILITY FOR LOW-INCOME HOUSEHOLDS

GOAL: Energy efficiency and accessibility to low-income consumers.

03-06-01 Objective

- To build upon a partnership of government, regulated utilities, businesses and the public to contain costs, provide assistance where needed, and promote conservation.

03-06-02 Background

According to the National Consumer Law Center, energy expenses in low-income households represent a disproportionately large share of disposable income. Energy costs are typically 15-25 percent of gross income for low-income households, compared to approximately 5 percent for the general population.

On the average, energy expenses for low-income households in Rhode Island amount to nearly $1,500 a year, a major portion being paid by state government in the form of direct government assistance, or housing subsidies. The federal Low Income Home Energy Assistance Program (LIHEAP) is one type of assistance. Congress appropriated $1.4 billion to the program for fiscal 2000.

Aid from LIHEAP is provided through a federal block grant to the state, which has significant latitude in administering the funds. Assistance is available to households whose income is at or below 60 percent of the Rhode Island state median income and who are thus particularly vulnerable to increases in home heating costs.

Grant benefit levels are determined by a matrix reflecting household income, family size, fuel type, and energy burden. Calculations are designed to provide greater assistance to larger households with lower incomes and higher heating bills.

Primary grants for households heating with a *non-regulated fuel source* (oil, wood, coal, etc.) range from a minimum of $100 to a maximum of $1,200.

Improving energy conservation could significantly reduce the financial impact of these assistance programs on government and taxpayers. Providing weatherization services, purchasing more energy-efficient appliances and heating systems, and using energy-conscious building design could do this. However, there are barriers that need to be addressed specific to this sector of the population. They include, but are not limited to, absentee landlords, high tenant turnover, poorly trained building maintenance staff and lack of funding.

03-06-02-01 Weatherization Assistance

Although LIHEAP provides very tangible, critical assistance, it exists only as emergency help and does not in itself empower low-income utility customers to take control over their energy costs. Such an improvement requires a three-pronged approach that integrates weatherization, energy education and fuel assistance.

The Weatherization Assistance Program (WAP) as currently authorized allows states to direct up to 15 percent of their HHS-LIHEAP block grants for weatherization of low income households. (This may include such basic improvements as better insulation or tighter windows and doors to prevent drafts.) In Rhode Island, funding for WAP is provided from a combination of sources, including Narragensett Electric, ProvGas, a U.S. Department of Energy grant, and LIHEAP funds. The amounts received from other funding sources have fluctuated. Seven nonprofit subgrantees within the state perform the necessary WAP services.

Currently, eligibility for WAP is based on the same 60 percent median income criterion as is LIHEAP. A family of four, for example, must earn less than $37,403 to qualify.

Since August 1977, WAP has completed 26,621 homes, thereby benefiting 73,163 low income Rhode Islanders. The estimated cumulative energy savings from these homes is approximately 8.6 trillion Btu, the equivalent of 63 million gallons of oil.

In 1990, WAP began targeting high-energy user households in cooperation with the LIHEAP program. Approximately 50 percent of WAP's completions since 1990 have been high-energy users. Many of these households are high-energy users because of poor insulation, inefficient heating systems, incorrect metering, etc.

03-06-03 The Future

While Rhode Island has been able to maintain its energy policy for the poor, it will be a challenge to do so in the coming years, particularly if there is an increase in caseloads, higher energy prices, a less robust economy and depletion of funding. The state must develop new and innovative ways of stretching

remaining fuel assistance dollars farther, and create more incentives to conserve energy.

03-06-04 Policy Recommendations

- The State Energy Office should establish policies to ensure that only the truly needy receive energy assistance and that energy vendors participating in the program charge the lowest possible price to low income households.

- New policy initiatives must be explored which link energy need to adequate housing for the poor and which focus on lowering those costs to make them affordable.

03-06-05 Other Recommendations

- The State Energy Office, in cooperation with other appropriate parties, should identify and investigate specific opportunities available to improve energy efficiency in public housing and low-income households and prioritize opportunities according to energy intensity, building type, age and ability to submeter energy use.

- The State Building Commission should encourage new public and low-income housing construction and renovation specifications and equipment procurement requirements to meet or exceed the most recent energy efficient model building energy codes issued by the national code agencies and equipment appliance standards.

- The state should continue to lobby Congress to keep LIHEAP alive and sufficiently funded to be effective.

- The State Energy Office, in conjunction with the Governor's Office, should re-evaluate the adequacy of current program services available to low-income and public housing families. This will help identify opportunities to prioritize funding for specific energy efficiency improvements.

- The State Energy Office should petition the Governor and the General Assembly to supplement WAP with the state budget.

- The State Energy Office should solicit in-kind and/or voluntary contributions from the energy providers industry. These contributions could be in the form of funds, materials, labor or services.

- The General Assembly should implement a tax check-off on Rhode Island income tax forms dedicating those funds to WAP.

03-07: ENERGY EDUCATION

GOAL: Energy education available at all levels, beginning in grade school.

03-07-01 Objectives

- To raise public awareness of energy issues, and inform consumers of the energy choices and services available to them.

- To train tomorrow's energy professionals and technicians.

03-07-02 Background

Rhode Island residents will define their energy future by the decisions they make about how they heat, cool and light their buildings, produce their goods and services, and get to and from their workplaces. An important goal of this plan is to educate our citizens about energy and its monetary, social, and environmental costs. An understanding of how energy is intertwined with other issues, including economic development, the environment and transportation, is vital. To have consumers ask and be able to answer the question "What happens to our energy dollars?" could also advance an energy conservation agenda.

An effective energy education component is critical for implementing the other energy goals presented in this plan. Energy education should not be limited to the classroom. Education programs should encompass the following four areas:

General education — For making our citizens more energy literate. At all levels, energy education must be inclusive, providing opportunities for those who have been traditionally under-represented in the technical, scientific and energy related fields. Community outreach programs are particularly important to help everyone understand various ways to save energy and money.

Targeted education — For making specific populations aware of new technologies, new techniques, and new codes in energy related fields such as construction trades, building operators, etc.

K-12 education — For ensuring prudent future energy use. Energy education should be rewarding and fun for children through interdisciplinary, hands-on, creative training and incentives. Our children, through improved education, will thus become enthusiastic and capable energy consumers and planners of the future.

Some effective curricula are currently being used in Rhode Island schools, and are available through utility education programs, from federal agencies and other states, or through the very successful Rhode Island National Energy Education Development (RI NEED) Program. Energy education in the schools should be designed to advance student achievement and should fit within science frameworks presently being developed.

Higher Education — For training tomorrow's professionals and technicians, including architects, engineers, economists, planners and teachers. The link between energy, economics and the environment dictates that professionals and technicians be well versed in the field of energy.

Each of the these categories is important to Rhode Island's energy future. A vibrant educational program will require the involvement of state and local agencies, utilities, public and private educational institutions, nonprofit, and business and professional associations.

03-07-03 Policy Recommendation

- It shall be the policy of the State of Rhode Island to lead by example. The Governor should issue an Executive Order directing state agencies to become models of energy efficiency and coordinate energy education efforts among state agencies.

03-07-04 Other Recommendations

- The state should encourage and support education activities by federal, regional, state and local, public and private organizations to increase the energy literacy of the people of Rhode Island. Efforts should be supported by utilities, consumers and environmental groups to build public understanding of energy and its use in their homes, businesses, industry and transportation.

- Colleges and universities should examine their engineering and architecture programs to ensure that tomorrow's professional graduates are prepared to design buildings and infrastructures that are energy efficient and environmentally sound. Professional standards and mid-career training should include the connections between energy efficiency, environmental, social, and operating costs, and good design and construction.

- Higher education programs should include energy education units in the curriculum, in-service teacher training, and general college and university courses that focus on the ties among energy, the environment, and economics.

- The State Energy Office should promote, through education, public responsibility for the efficient and effective use of energy resources.

- The State Energy Office should coordinate and implement a Statewide Public Information and Education Campaign in order to distribute the *Rhode Island Energy Plan,* summaries of its key elements, and related information on specific steps that people can take to achieve its goals, and to encourage feedback on the recommended actions. The cost of the campaign will be minimized, and its impact maximized, through effective coordination and involvement of all parties who can contribute resources and effort.

- The State Energy Office should maintain a clearinghouse and database of educational materials and information. Comments on the quality of these materials will be sought as a guide for future users. The clearinghouse will also coordinate sharing of new curriculum ideas and other educational activities. The State Energy Office should then work through the clearinghouse and with other parties to disseminate to schools, businesses, civic groups and other interested parties information on existing energy-related educational materials, services, curricula and funding sources.

- The State Energy Office should provide alternative fuel vehicle training through a series of workshops designed to educate users about alternative fuel vehicle requirements, technologies, infrastructure issues and economics. Multiple workshops will be held to permit workshop interaction and to tailor sessions to different types of fleets, their users and vehicle maintenance personnel. The workshops are intended not only to provide an informational base, but to learn

more about needs and to open lines of future communication in this rapidly changing field.

03-08: RENEWABLE RESOURCES

GOAL: The development of permanently sustainable energy resources that are environmentally benign and economically feasible.

03-08-01 Objectives

- To ensure that future generations are not left with the environmental, social and financial impacts of depleted, non-renewable energy resources.

- To take advantage of indigenous resources and decrease our dependence on fossil fuels.

03-08-02 Background

The development of renewable energy resources in Rhode Island should be encouraged in order to assure a balanced and sustainable energy future. Development and increased use of renewable resources will improve the state's long-term economic competitiveness, environmental quality, energy security, and public health and safety. While renewables clearly will not satisfy all of Rhode Island's energy needs, their supplementing role can certainly be an important one.

The economic, health, and environmental benefits of renewable energy are being recognized across the nation. To date 13 states, including Massachusetts and Connecticut, have adopted a *renewable portfolio standard,* which requires everyone to obtain a fraction of their energy from renewable sources. The increased demand for renewable energy encourages new project development.

Accordingly, the state should take action to accommodate the growth and expansion that will be necessary for renewable resources to make that meaningful contribution. Our energy policy and regulatory decision-making should account fully for the considerable environmental benefits of renewable resources, as well as the equivalent Btu value of fossil fuels they can replace in everyday use.

Renewable resources consist of wind, geothermal, solar (including photovoltaics), biomass, and hydro. Their strengths and weaknesses were reviewed briefly in Part Two.

In the Northeast, a strong move toward the use of woodstoves and fireplace inserts was experienced when the price of home heating oil sprang upward in the 1970s. With a net annual growth of more than 60 million cords in our forests, wood can always be something of a fuel staple in our region. Modern woodstoves, now certified by the Environmental Protection Agency, use a variety of technologies and have the advantage over their forebears of including catalytic combustors and

redesigned burning chambers, significantly increasing fuel efficiency and reducing emissions.

03-08-02-01 Changing Scene

The opportunities for utilizing renewable energy resources changed in the last few years due to several factors. Primary among them have been the rise in oil prices and, concurrently, the reinstatement of pertinent federal and state tax credit programs.

The market opportunities for renewables today are driven by a very different set of expectations regarding conventional fuel price escalation rates, along with a more mature understanding of the capabilities of the various technologies. The net result is that wind energy, photovoltaics, and solar domestic water and space heating technologies and geothermal are becoming economically competitive with the more conventional methods of energy conservation and efficiency.

The fact that these technologies are renewable makes them even more appealing and compelling and future energy system development is certain to occur.

As renewables become more economically competitive with conventional systems, technologies like photovoltaics will become more important, especially in remote areas. Even "low-tech" solar applications such as passive solar designs that allow the sun to provide natural warmth and light through window space are important for energy conservation, and should be encouraged. In addition, there are now tax incentives and rebates available to homeowners.

In 2000 the R.I. General Assembly passed S 2280, the Renewable Energy Sales Tax Credit (Chapter 56) and the Residential Renewable Energy System Tax Credit (Chapter 57). This law provides for a tax credit and sales tax refund to purchasers of certain types of renewable energy systems including solar, wind and photovoltaic energy systems.

Other notable legislation includes the Utility Restructuring Act of 1996, which resulted in the creation of the “Rhode Island Renewable Energy Collaborative” (RIREC). The RIREC is charged with administering the System Benefits Charge that is collected as a result of the restructuring law. The RIREC includes representatives from the Conservation Law Foundation, the Department of the Attorney General, the Division of Public Utilities and Carriers, the Energy Council of Rhode Island, Narragansett Electric, the Pascoag Utility District, and the Rhode Island State Energy Office.

Currently, the RIREC has a photovoltaic (PV) program, a PV outdoor lighting program, an effort to locate a site for wind power in Rhode Island, a potential landfill gas project in Cranston, and a request for proposal on fuel cells and other renewables project. To date, the RIREC has provided buy-downs for about ten PV systems including a 43kW system, four PV outdoor lights, and one

200kW fuel cell. For homeowners interested in installing a PV system, the RIREC is now providing a buy-down of $3.00 per watt. A $379,000 grant from the U.S. Department of Energy enabled over 70 solar/wind projects to be installed on Block Island (which is not covered by the RIREC). The State Energy Office will continue to look for ways to further the development of renewables in the state.

03-08-02-02 Hydroelectricity

In 1980, the Governor's Office prepared a study of the potential in Rhode Island for renewable energy systems. Hydropower was among the options considered. This study identified 138 dams with capacities totaling 54MW. Some of these potential projects have been or are being developed, but many are not cost-effective at present.

An inventory of the small power production facilities in Rhode Island prepared by the New England Governors' Conference showed that there are eight hydro-powered units, ranging in size from 10kW to 2MW (and totaling 7.02MW) that were in operation in the early 1980s. By 1999, total hydropower capability in Rhode Island had fallen to 4MW. ((11))

While other sites, particularly at existing dams, are developable, such issues as anadromous fish restoration (the reintroduction of fish species that spawn upstream, such as salmon) and impacts on shoreline usage may emerge as possible conflicts. ((11))

The disadvantages of disruptions that may occur to river and stream flows due to hydroelectric facilities may outweigh the value of the electricity produced from a particular facility. At best, as stated before, the potential in Rhode Island for hydropower is not very large.

03-08-02-03 Biomass

The combination of burning wood as the primary home heating source, while maintaining electric baseboards or portable electric heaters for backup, is not uncommon. New technologies in woodstove construction reduce particulate emissions and have the added positive effect of increasing combustion efficiency and reducing creosote build-up in flues. Given these advances and the general availability of wood as a fuel, this direct use of biomass has become significant within the context of an overall state energy policy.

Also to be addressed is the potential for combusting untreated wood waste in industrial or commercial facilities to alleviate our growing waste stream from construction and demolition debris. These would include wood-powered electric generating plants. As with all wood combustion processes, such facilities would have air quality impacts. However, if the air emissions problems can be resolved successfully, and other environmental impacts are acceptable, such facilities ought to be encouraged. In any event, the contribution that the facilities in Rhode Island

might make to meet overall electricity requirements is expected to be relatively small.

Another type of biomass facility, with a capacity of 12MW, is active at the Central Landfill in Johnston, R.I. It is fueled by methane — landfill gas. On the whole, such facilities should be encouraged. Using landfill methane for electric generation or heating can have both an energy and environmental benefit, since existing landfill emissions sustain their own air quality problems. However, methane facilities, like other generating plants, may also result in emissions impacts that must be carefully assessed and monitored. The RIREC is considering an application to expand current capacity at the landfill.

03-08-02-04 Wind Energy

Wind energy is a resource with some potential in Rhode Island. As mentioned in Part Two, Block Island had a utility-scale wind turbine, but it could not compete in price with conventional utility power. Wind resources in the state are not exceptional and are, on the whole, only sufficient to power a wind turbine at a 15-25 percent capacity factor.

Generally speaking, particularly in localized areas where wind regimes may be sufficient to support cost-effective power generation, land use and aesthetic considerations may preclude such development. At this time, large-scale development of wind power in Rhode Island is not likely to be a reality for many years, mostly due to a combination of wind speed, appropriate land use, and willing landowners.

Proponents of this form of renewable energy can take heart in the fact that this will not preclude wind development in other parts of the country. South Central Vermont is home to the first commercial scale wind power facility in the Northeast. Since June of 1997, eleven 550kW wind turbines have been converting the power in the winds blowing across the Green Mountains into emission-free renewable electricity for Green Mountain Power's customers. ((23))

As the newsletter *World Energy Update* commented, "Wind energy will provide one of the cheapest sources of power within the next decade. It is also a resource that knows no political or geographic boundary. These projects demonstrate that [in many areas] wind is becoming competitive with many conventional forms of electrical power generation." ((7))

03-08-02-05 Solar

Rhode Island receives between 3,500 and 4,000 Watt-hours per square meter per day (Whr/m/d) of energy from the sun on a horizontal surface, also referred to as daily global solar radiation. With the buydowns now available for PV, coupled with the tax incentives for renewables, solar/PV systems in rooftops will become a common sight in the state.

In the transportation sector, solar electric cars, which were virtually unheard of a few years ago, have won new interest through racing and endurance competitions sponsored by technical schools and universities. Solar cars, which run on electricity generated by photovoltaic solar panels, can help reduce urban air pollution and our reliance on foreign oil if they reach the marketplace and are accepted by consumers.

03-08-03 Policy Recommendations

- State policy should encourage continued private sector development of renewable energy applications and support studies to determine the feasibility of establishing a renewable portfolio standard for Rhode Island.

- State buildings and other government facilities should use renewable energy applications wherever practical in new construction and at opportunities for replacement.

- State policy should encourage *all* buildings to use renewable energy applications wherever practical.

03-08-04 Other Recommendations

- The State Building Code Commission should specify minimum standards using natural heating and cooling to improve energy efficiency. Appropriate designs incorporating both passive and active solar should be encouraged.

- The State Energy Office should render whatever assistance it can (such as grants or technical advice) on a case-by-case basis to individuals, municipal agencies and institutions who wish to utilize solar, wind, or any other renewable resources.